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Investigating the Role of Personalized Digital Extension Services on Agricultural Performance (A Case Study of Farmers in Fars Province)

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Abstract

Digital technologies could enhance the effectiveness of extension by reducing outreach costs and helping to better tailor the information to farmers' individual needs and conditions. The digital extension services that some of the farmers' use provide personalized information on the types of crops to grow, the types and quantities of inputs to use, and other methods of cultivation. Therefore, the purpose of the present study is investigating the role of personalized digital extension services on agricultural performance (a case study of farmers in Fars province). In terms of the purpose of an applied research and based on the nature of the research data, it is considered a descriptive-survey research. The statistical population of this research included 287,863 farmers in Fars province. Morgan's table was used to calculate the sample size. According to this table, the sample size under investigation is 385 people. A panel of experts was used to determine the validity of the questionnaire and Cronbach's alpha test was used to calculate the reliability of the questionnaire. Its value for the whole questionnaire was 898, which shows that the questionnaire has good reliability. To analyze the research data in the descriptive statistics section of the mean, median, frequency and frequency percentage and in the inferential statistics section of the structural equation modeling method with the partial least squares approach (PLS SEM) in the three main sections of external model evaluation (examining the relationship between the question and the variable), the internal model (examining the relationship between the variables) and checking the fit of the model using SPSS 21 and Smart PLS 2 statistical software. The results of the partial least squares technique showed that personalized digital extension services have a positive and significant effect on agricultural performance, agricultural income, variety of product production, intensity of input consumption, product productivity, willingness to use technology and product commercialization of farmers in Fars province.

Keywords:
Personalized Digital Extension Services, Agricultural Performance, Income, Commercialization

1. Introduction

One of the important sectors in the economic development of the country is the agricultural sector. Paying special attention to this sector in a vast country like Iran will bring valuable results. In the meantime, the use of advanced aspects of information and communication technology will provide fundamental changes and progress in the agricultural sector (Moosaei and Saydnejad, 2021).

The agricultural sector, as one of the most important economic activities, requires coherent planning in order to achieve development and deal with economic, social and political crises. In the last two decades, proper planning in order to properly exploit the resources and potential abilities of this sector and the application of support policies have improved the production situation in the agricultural sector and the country's economy. The increase in agricultural production increases the export process and constitutes a high share of non-oil exports related to agricultural products.

Providing about 17% of GDP and 22% of labor force employment by this sector is one of the other components that makes its importance more obvious. In developing countries (Third World), the growth of agricultural performance in small farms can act as an important driver of economic growth and poverty reduction (Mellor & Malik, 2017; Ogutu & Qaim, 2019). However, small farm owners in particular face many challenges, for example, unpredictable weather conditions, market risks, limited access to information, technologies and financial services, and other constraints causing low yield and low yield rates. Participation in digital markets. (Key et al., 2000) Therefore, a fundamental and key question that exists for the growth of rural development and poverty reduction is how to overcome the main information and market access limitations that smallholder farmers face?

In rural areas of developing countries, where most people rely on agriculture for their livelihood, digital technology can help overcome global poverty and hunger faster. In digital agriculture, farmers use mobile phones and other technologies that can revolutionize communities to secure and improve their livelihoods. The goal of "a world with zero hunger" by 2030 (FAO, 2017). Precision agriculture technologies are changing the face of modern agriculture. Digital advances such as wireless communications, data analytics, and data-driven genome editing are rapidly being used in agriculture as they provide greater precision in decision-making and action. Farm equipment connects to software platforms that track on-farm data and allow analysis of soil and weather conditions. Consumers and farmers will become closer to each other due to digitalization. Consumers can learn about plants and animals that make agriculture more transparent. Smart agriculture affects agricultural production in the long term (Padhy et al., 2022).

The results of many researches show that digital technologies can significantly reduce the cost of communication. Reducing costs leads to increasing market efficiency, development, economic growth and poverty reduction (Aker, 2011; Torero and von Braun, 2006). The research results indicate the positive role of mobile phones on the development of agriculture. The use of mobile phones can increase or decrease the amount of sales. Also, the use of mobile phones can increase the purchase price (Aker, & Fafchamps, 2014; Shimamoto et al, 2015), increase access to the smallholder market (Fan & Salas Garcia 2018; Zanello, 2012) and increase farm productivity and income (Aker & Ksoll 2016; Fu & Akter, 2016), some studies have also analyzed the effects of mobile phones on other dimensions of smallholders' well-being and positive effects on nutrition and gender equality (Parlasca et al, 2020), Sekabira & Qaim 2017; Leng et al, 2020) shows off-farm employment (Leng et al; 2020) and migration (Muto, 2012).

Most of these researches or studies focus on mobile phones as a simple communication tool. Most of the studies have focused on the impact of mobile phones on different aspects of agricultural development. Several other studies investigated the effects of mobile phones, including the impact of mobile phones on farm performance and family well-being (Kikulwe et al 2014; Sekabira & Qaim 2017). In general, the results of these studies indicate the usefulness of mobile phones for smallholder farmers and its impact on farmers' performance. While various types of information and communication technologies are increasingly used in agricultural extension, few studies have been conducted on the impact of digital services on the performance of smallholder farmers. Farmers through mobile phones, text messages or internet applications and it means increasing the productivity and efficiency of the (Fu & Akter 2016; Fafchamps & Minten, 2012; Omulo G, Kumeh EM Aker, 2012). Other studies are also available that have investigated the effects of using educational videos or contact centers and interactive voice response services for farmers. (Aker, 2016; Van Campenhout et al., 2021; Van Campenhout et al., 2017). In this regard, a research was conducted to analyze the relationship between the use of personalized digital extension services and the agricultural performance of small farms in India. The digital software that was studied included a broader package containing advice for farmers who were growing vegetable crops. The research investigated the following: what species and varieties should farmers cultivate, how much of different chemicals should they use, and how can they obtain inputs with good quality and reasonable prices. Digital technologies can help to better personalize agricultural advice in the field of using inputs that are used in different ways for the personal needs of each farmer. For example, predictive analytics and machine learning algorithms can be used to combine data and predict weather, soil conditions, market prices, and other aspects to improve and distribute region-specific agricultural recommendations. The results show that the use of personalized digital extension services is positively and significantly related to input intensity and crop diversity, agricultural performance and crop income. (Mellor & Malik, 2017). Paloui and Vakoim (2021), in a study investigated the relationship between personal counseling and farm performance. In this study, a survey of small vegetable farmers was conducted in early 2019. In 2019, some of the surveyed farmers had already adopted digital extension services, while others had not. The results show a positive and significant relationship between the adoption of personalized digital advice and various indicators of farm performance, including intensity of input use, production diversity, vegetable productivity and vegetable income. The access of small owners to the market and the increase of farm productivity, and due to the impact of information and communication technology on all aspects of farmers' lives, including reducing migration to cities, increasing welfare and raising the standard of living of farmers, gender equality, nutrition and second jobs, have positive effects. had. Most of these studies focus on mobile. (Muto, 2012; Zanello

2012). Digital extension can exercise large economies of scale to generate analytical insights and improve customization. In turn, the iteration of these insights and improvements can progressively increase impacts over time. Digital platforms generate large volumes of user data which can be utilized for constant experimentation and adjustments at low cost. The addition of more users and generation of more data allow for faster experimentation and advanced analytics – for example, through the use of machine learning – leading to faster improvements in the quality of customization and the magnitude of potential impacts. The progressive increase in returns to scale implicit in digital systems suggests that systems operating at scale, and leveraging data for constant learning, will likely derive the largest impacts. (Madon et al, 2022)

Despite the potential of digital extension services many implementation challenges remain. For instance, many existing agricultural mobile-based systems are based on one-way, "push-only" approaches that focus on broadcasting one specific type of information (e.g., prices, specific recommendations for a crop, etc.). Not all information is useful, actionable, or accessible. The value of information depends on context. therefor We want to analyses the association between using digital extension services and agricultural performance. Agricultural performance is evaluated in terms of crop production diversity, input use intensity, crop productivity, crop commercialization, and crop income. It is reminded that so far little research has been done in the field of digital promotion in Iran and less researchers have investigated the role of personalized promotion in the country, and for this reason this research is unique and this shows the importance of the research problem and its difference from The works of other authors are in this field.

Research Background

Abubakar Khidir et al., (2022). has conducted a study entitled The Estimation Model of Determinant of Mobile Phone Apps' Usage by Smallholder Farmers in North West Nigeria, The results of the research have shown that though most frequently used mobile applications include voice call app (mean value of 1.410), SMS app (0.932 mean score) and Opera with 0.640 mean value, weighted mean values showed that all the apps were rarely being put to use by the farmers, indicating generally low frequency of usage. NBRM analysis results showed that educational attainment, knowledge, phones farmers operate well, phone as information garget, app store, social media and agencies as sources of apps positively influenced the frequency of mobile apps usage.

Moosaei and Seydenjad (2021) have conducted a study on the role of information and communication technology in agricultural systems and the transition to sustainability and food security. The results of the research have shown that information and communication technology has a positive and significant impact on agricultural systems. On the other hand, agricultural systems affect food security and sustainable agriculture. Finally, the results of this research showed that information and communication technology through agricultural systems has a positive and significant effect on food security and sustainable agriculture. (International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EESs). 12(2):81-88.) (Reply to comment 10)

Bagheri (2018) has conducted a study entitled Information technology as a platform for the development of intelligent agriculture. In this study, considering the importance of using smart technologies in the field of agriculture, while introducing this technology and referring to some of its applications, it has been tried to identify the necessary platforms for the development of this technology. Also, in this article, the necessary requirements for the proper development of this technology in the agricultural sector have been discussed according to the current conditions. The results of this research have shown that ensuring food security despite limited resources, climate changes and environmental problems requires changing methods and approaches in the production of agricultural products.

Kudama et al., (2021) in a study titled "Will digital solutions transform sub-Saharan African agriculture?" To briefly examine the impact of digital solutions on the agricultural transformation of smallholder farmers, and the key and challenges affecting the digitalization of agriculture in sub-Saharan Africa. they have payed. An extensive review of the results shows that digital solutions, when used effectively in sub-Saharan Africa, enable smallholder farmers to achieve a wide range of benefits, including access to timely price, market and agricultural information and secure financial transactions, alternative value chain links. , get multifaceted knowledge, better income. and efficiency, cost reduction, social welfare and risk minimization, benefits of women's empowerment. On the other hand, non-use of adaptable tools, lack of affordability, digital illiteracy, low participation of women and small farmers due to their low income and educational status are the main obstacles to digitization in agriculture.

McCampbell et al., (2021) in a study entitled "Are farmers ready to use telephone-based digital tools for agricultural advice? Assessing ex ante user readiness using the case of Rwandan banana farmers" to ex ante assess user readiness for telephone-based services. They have paid the phone. Findings show limited capacity to access and use phone-based extension services, especially those requiring a smartphone, and a mismatch between expected user readiness and actual user readiness, capabilities, and current opportunities. The findings provide entry points for designing appropriate digital development projects and interventions and suggest the need for capacity building.

Rajkhowa and Qaim (2021) in a study entitled " Personalized digital extension services and agricultural performance: Evidence from smallholder farmers in India" investigated the relationship between digital development services and smallholder agricultural performance. Digital extension services that some farmers use provide personalized information about the types of crops to grow, the types and amounts of inputs used, and other cultivation methods. Problems of selection bias in impact evaluation are mitigated by matching propensity scores with estimates of farmers' willingness to pay for digital development. The results show that the use of personalized digital development services is positively and significantly related to input intensity, production diversity, product productivity, and product revenue.

Parlasca et al., (2020) in a study entitled "Can mobile phones improve nutrition among pastoral communities? Panel data evidence from Northern Kenya" The estimates show that mobile phone adoption and use are positively and significantly associated with dietary diversity. The effects are particularly large for frequent mobile phone users. We also examine the underlying mechanisms. Mobile phone use improves dietary diversity mainly through better access to purchased foods. These results encourage the promotion of mobile phone technologies as a valuable tool for nutritional improvements, especially in remote rural settings with poor access to food markets.

Fleke et al., (2020) conducted a study titled Digitalisation of agricultural knowledge and advice networks: An Advanced Review. Digitalization is widely seen as having the potential to deliver productivity and sustainability for the agricultural sector. However, there are likely to be broader implications from the digitization of agricultural innovation systems. Agricultural knowledge and advisory networks are important components of agricultural innovation systems that have the potential to create digital disruption. In this study, trends in agricultural knowledge and advisory networks and potential developments in these networks have been investigated internationally and in Australia.

Sebastian and Jayalakshmi (2019) in a study titled "Using digital tools for horizontal expansion of agricultural technologies by Kerala farmers" investigated a study among Kerala farmers who used different digital tools during 2018-2019. The research sample included 120 farmers from three districts of Kerala. The awareness and preference of the respondents were studied in order to find horizontal expansion. Based on the results obtained, it was found that all the farmers were aware of tools such as television, mobile phone and social media. Most of the farmers chose mobile phones as the best tools. It was found that farmers use mobile phones mainly for "crop protection" purposes and social media for "marketing" purposes.

Rijswijk et al., (2019) conducted a study titled Digitization in New Zealand's Agricultural Knowledge and Innovation System: Early Understanding and Emerging Organizational Responses to Digital Agriculture. Digital agriculture is likely to transform production processes both on and off the farm and in the wider social and institutional context through the use of digital technologies. The findings show that digitization is often referred to as farm-oriented. These understandings influence an organization's digitization response to digital agriculture.

Research hypotheses

The main hypothesis

Personalized digital extension services have a significant impact on agricultural performance (input intensity, production diversity, product productivity, product income).

Sub-hypotheses

There is a significant relationship between personalized digital extension services and agricultural productivity.

There is a significant relationship between personalized digital extension services and farmers' income.

There is a significant relationship between the personalized digital extension services and the variety of farmers' production.

There is a significant relationship between personalized digital extension services and intensity of agricultural input consumption.

There is a significant relationship between personalized digital extension services and agricultural commercialization.

There is a significant relationship between personalized digital promotion services and small-scale and large-scale exploitation systems in the willingness to use technologies.

2. Materials and Methods

In terms of the data collection method, the current research is a cross-sectional survey descriptive research. This research was conducted with the aim of investigating the role of personalized digital extension services on the agricultural performance of farmers in Fars province, and it is an applied research. In terms of nature, it is a descriptive (non-experimental) research. The statistical population of farmers in Fars province is 287,863 people, so the sample according to Morgan's table is 384 people. The main tool for collecting research data is a researcher-made questionnaire. A panel of experts was used to obtain the validity of the questionnaire. And Cronbach's alpha test was used to calculate reliability. The results are given in Table 1. Cronbach's alpha coefficient is 0.898. Therefore, the reliability of the questionnaires has been evaluated favorably.

Table 1. Cronbach's alpha value calculated for the questions of the research questionnaire.

main factors	Number of items	Cronbach's alpha
Agricultural performance	4	0.80
Agricultural income	6	0.70
Product variety	3	0.74
Intensity of input consumption	4	0.74
The exploitation system of small ownership and large ownership	6	0.87
Efficiency	5	0.87
Product commercialization	4	0.84
Personalized digital services	4	0.73

The statistical methods used in this research can be divided into two categories: inferential statistical methods and descriptive statistical methods. To investigate and describe the general characteristics of the respondents, descriptive statistics methods such as frequency distribution tables and averages will be used. In the inferential statistics section, the conceptual model of the research is tested using the partial least squares technique. The analysis of the obtained data is done using $SPSS_{22}$ and Smart PLS_2 statistical software.

3. Results and Discussion

3.1 Descriptive Statistics

The results of the analysis of the data collected from the sample members show that most of the sample members are men, and out of 384 people, 89% are men and 11% are women. The results of the analysis of the data collected from The sample members show that people with income more than 50 million are the most with 222 people and people between 40 and 50 tomans are the least number with 16 people. The separation of the collected information of the sample members according to the level of education shows that the highest number of people with diploma education with 123 people and the lowest number of people with 32 people have master's and doctorate degrees. The results of the analysis of the collected information show that out of 384 people participating in the research, 18 people are less than 30 years old, 133 people are between 30 and 40 years old, 129 people are between 40 and 50 years old, and 104 people are more than 50 years old. The results of the analysis of the collected information show that out of 384 people participating in the research, 15 people are less than 5 years old, 28 people are between 5 and 10 years old, 121 people are between 10 and 15 years old, 133 people are 15 to 20 years old and 87 people are older. They are 20 years old. Other results are given in Table 2.

3.2 Investigating the type of data distribution using the Kolmogorov-Smirnov (ks) test

In order to analyze the research assumptions and choose the type of test and software, the distribution of the variables should be examined first. For this purpose, the Kolmogorov Smirnov test was used. The results of data distribution are presented in Table 3.

3.3 Checking the validity of the research questions

In this section, the research questions have been discussed in terms of validity to determine whether the questions are appropriate and also measure the desired variable well. The optimal factor load of indicators should be 0.4 or higher in the standard mode and more than 1.96 in the significant mode. The results are shown in Table 4.

The results of the validity of the questions of the research variables are shown in table 4. The results of this test showed that the factor loading of all the questions in the significance mode is more than 1.96 and also in the standard mode it is more than 0.3. As a result, the research questions have been approved, or in other words, it has been able to correctly measure the research variables.

Table 2. descriptive statistics of respondents

Characteristics	Frequency	%F	%CF
Gender			
Man	342	0.89	--
Female	42	0.11	--
Total	384	100	
Age/year			
30<	18	4.7	4.7
30-40	133	34.6	39.3
40-50	129	33.7	73
50>	104	27	100
Total	384	100	
Education			
Under Educated	68	17.6	17.6
diploma	123	31.9	49.5
Associate Degree	47	12.2	61.7
Bachelor's degree	114	29.9	81.6
Masters degree and higher	32	8.4	100
Total	384	100	
Income/million Rials			
200<	112	29.3	29.3
200-300	34	8.7	38
400-500	16	4.2	42.2
500>	228	57.9	100
Total	384	100	
Agricultural work experience/ year			
5≤	15	3.9	3.9
5-10	28	7.2	11.1
10-15	121	31.6	42.7
15-20	133	34.6	77.3
>20	87	22.7	100
Total	384	100	

Table 3. Kolmogorov Smirnov test

Variables	Sig	Result
Personalized digital extension services	0.000	abnormal
Agricultural income	0.000	abnormal
Product variety	0.000	abnormal
Intensity of input consumption	0.000	abnormal
The exploitation system of small ownership and large ownership	0.000	abnormal
Efficiency	0.000	abnormal
Product commercialization	0.000	abnormal
Product performance	0.000	abnormal

Table 4. Checking the validity of the measurement model for research variables

Variables	question	Standard	Sig	Variables	question	Standard	Sig
Personalized digital extension services	Q1	0.892	86.458	The exploitation system of small ownership and large ownership	Q18	0.760	30.214
	Q2	0.896	83.217		Q19	0.830	44.516
	Q3	0.872	59.784		Q20	0.826	49.683
	Q4	0.889	75.281		Q21	0.839	45.322
Agricultural income	Q5	0.420	70.157		Q22	0.822	39.811
	Q6	0.805	40.240		Q23	0.518	11.202
	Q7	0.868	60.174	Efficiency	Q24	0.858	58.769
	Q8	0.846	630918		Q25	0.851	53.680
	Q9	0.858	55.024		Q26	0.834	40.788
	Q10	0.889	70.707		Q27	0.844	45.659
	Q11	0.797	23.745		Q28	0.581	15.890
Product variety	Q12	0.787	24.767	Product commercialization	Q29	0.888	84.375
	Q13	0.620	12.894		Q30	0.885	66.639
Intensity of input consumption	Q14	0.886	68.209		Q31	0.868	56.651
	Q15	0.898	86.905		Q32	0.884	76.514
	Q16	0.883	70.302				
	Q17	0.881	62.099				

3.4. Internal model test or structural equation model

The relationship between variables or hypotheses has been tested by structural equation testing and PLS software. Structural equations test the model in two meaningful and standard modes. In the case of significance, the factor load between the variables should be more than 1.96 to confirm the hypothesis, and in the standard case, the amount and intensity of the effect between the variables are examined.

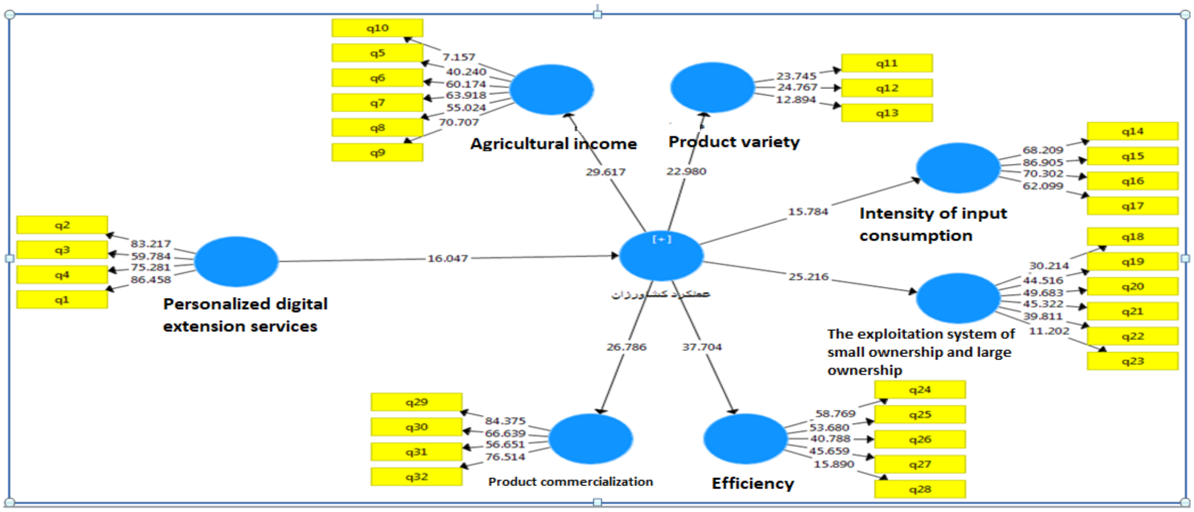

Figure 1. The research model in meaningful mode

Figure 1 shows the results of structural equations in a significant state. In the case of significance, the value of t (the path coefficient in the case of significance) must be greater than 1.96 so that the relationship between the variables or research hypotheses is significant.

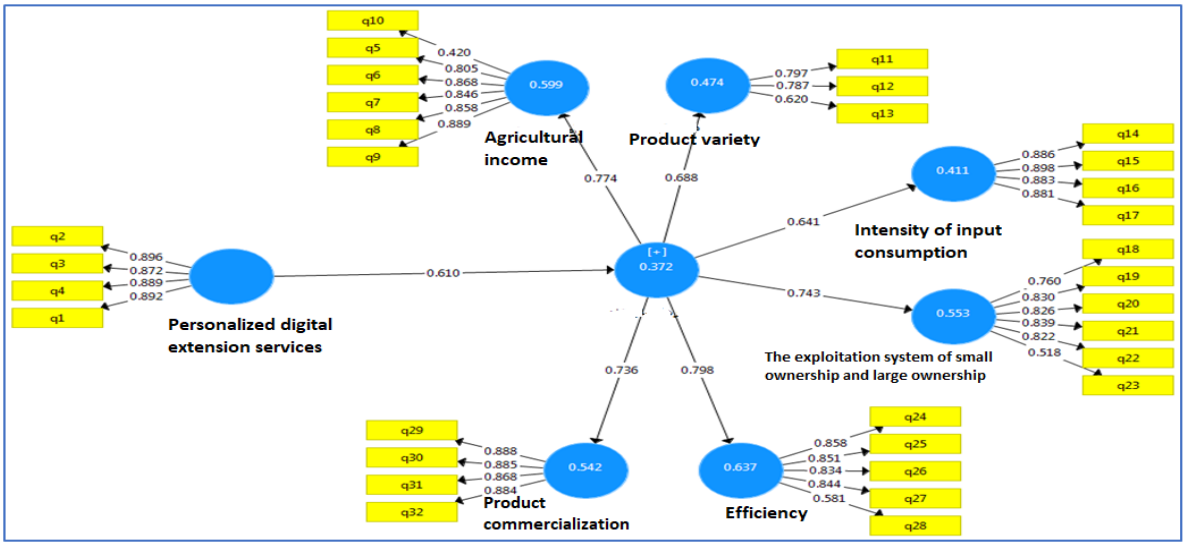

Figure 2. Research model in meaningful mode

Figure 2 shows the results of structural equations in a significant state. In the case of significance, the value of t (the path coefficient in the case of significance) must be greater than 1.96 so that the relationship between the variables or research hypotheses is significant. Considering that the value of t for the relationship between the variables is more than 1.96, the relationship between the independent variables and the dependent variable of the research has become significant.

3.5 Model Fit

The GOF test was used to check the fit of the model. The results of which are given in Table 5. The general criterion of fit (GOF) is calculated by calculating the geometric mean of the mean of the subscription and is calculated as follows:

$$\mathrm{GOF} = \sqrt{\overline{\mathrm{communality}} \times \overline{R^2}}$$

$$\mathrm{GOF} = \sqrt{\overline{\mathrm{communality}} \times \overline{R^2}} = \sqrt{0.512 \times 0.446} = 0.477$$

Table 5. Cummunality value and R^2 of research variables.

Variables	Cummunality	R^2
Efficiency	0.450	0.637
Product commercialization	0.578	0.542
Product variety	0.141	0.474
Personalized digital extension services	0.593	-
Agricultural income	0.488	0.599
Intensity of input consumption	0.591	0.411
The performance of farmers	0.298	0.372
The exploitation system of small ownership and large ownership Product performance	0.433	0.551
Average	0.446	0.512

According to Table 5, the value of GOF for the research model has been calculated as 0.477, which shows the good power of the model in predicting the endogenous current variable of the model.

4. Conclusion and Recommendation

The results of the structural equation test to investigate the impact of personalized digital extension services with agricultural performance showed that a significant value equal to (16.047) was obtained, which is greater than the critical limit of 1.96, as a result of which the main hypothesis was confirmed. Is. The value of the factor load in the standard mode is also equal to (0.610), which shows that the impact of personalized digital extension services with agricultural performance is positive and in a direct direction, because the obtained coefficient is positive.

The results of the structural equation test to investigate the impact of personalized digital extension services with agricultural productivity showed that a significant value equal to (16.275) was obtained, which is greater than the critical limit of 1.96, thus confirming the first hypothesis. has been The value of the factor load in the standard mode is also equal to (0.577), which shows that the impact of personalized digital extension services with agricultural productivity is positive and in a direct direction, because the obtained coefficient is positive.

The results of the structural equation test to investigate the impact of personalized digital extension services with farmers' income showed that a significant value equal to (8.935) was obtained, which is more than the critical limit of 1.96, thus the second hypothesis is confirmed. Is. The value of the factor load in the standard mode is also equal to (0.416), which shows that the impact of personalized digital extension services with farmers' income is positive and in a direct direction, because the obtained coefficient is positive. The research results are consistent with the research results of Hall 2018.

The results of the structural equation test to investigate the impact of personalized digital extension services with the variety of farmers' production showed that a significant value equal to (9.225) was obtained, which is more than the critical limit of 1.96, as a result of the third hypothesis. Confirmed. The value of the factor load in the standard mode is also equal to (0.421), which shows that the impact of personalized digital extension services with the amount of diversity of farmers' production is positive and in a direct direction, because the obtained coefficient is positive. The results of the research are consistent with the results of the Pavlovian and Vakyim research in 2021.

The results of the structural equation test to investigate the impact of personalized digital extension services with the intensity of agricultural input consumption showed that a significant value equal to (5.161) was obtained, which is more than the critical limit of 1.96, as a result of the fourth hypothesis. Confirmed. The value of the factor load in the standard mode is also equal to (0.262) which shows that the impact of agricultural input consumption intensity services is positive and in the direct direction, because the obtained coefficient is positive.

The results of the structural equation test to investigate the impact of personalized digital promotion services with small and large ownership exploitation systems showed that a significant value equal to (11.607) was obtained, which is more than the critical limit of 1.96. As a result, the fifth hypothesis is confirmed. The value of the factor load in the standard mode is also equal to (0.476), which shows that the impact of agricultural input intensity services with small ownership and large ownership exploitation systems is positive and in a direct direction, because the obtained coefficient is positive. The research results are consistent with the research results Muto, 2012 Zanello, 2012.

Personalized digital extension services have a significant relationship with agricultural commercialization. The results of the structural equation test to investigate the impact of personalized digital extension services with agricultural commercialization showed that a significant value equal to (13.087) was obtained, which is greater than the critical limit of 1.96, thus confirming the sixth hypothesis. has been The value of the factor load in the standard mode is also equal to (0.527), which shows that the impact of agricultural input intensity services with commercialization of agriculture is positive and in a direct direction, because the obtained coefficient is positive. The research results are consistent with the research results of Rao et al., 2017.

In order to increase productivity, it is suggested to farmers to create a crop certificate for their farm with personalized consultations and using digital platforms, and based on the test of personal soil and weather of the region, climatic conditions and personal capabilities, start crop planning to implement Appropriate crop rotation, change and correction of planting pattern, maintenance and correction of irrigation system and level of irrigation should be done to estimate the amount and amount of crop production. It is also recommended that by using personalized digital advice with methods to optimize the use of seeds, fertilizers and poisons and to know the best irrigation methods and plant water needs, and even by increasing innovation and creativity in the way the product is presented, they can use the same sources with a few changes. Have a significant increase in income.

Farmers can avoid wasting resources and improve their productivity and income with personalized digital advice and identification of plant needs and the best time for planting, watering and feeding, and even fighting weeds or the intensity of pest and disease control thresholds. In this regard, creating digital consultations and membership in digital agricultural groups such as WhatsApp, etc., and using virtual trainings are recommended.

In order to conduct further research on the research problem, it is suggested that other researchers choose the following as the subject of their research:

Investigating the factors affecting the use of digital extension tools by farmers. Investigating the role of personalized digital extension services on Sustainable development of agriculture.

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